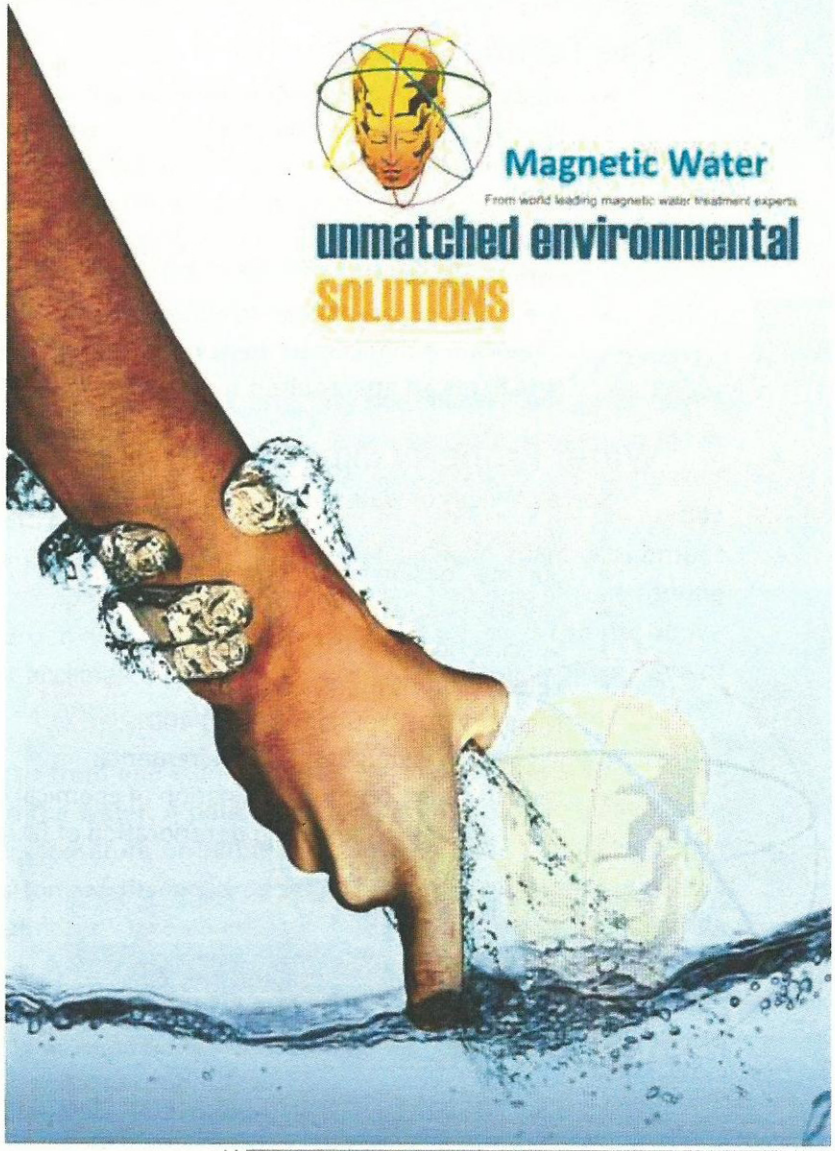
2014

Magnetic Water Treatment
Fresh. Ground. TSE



Introductory Briefing

MagTech (Pvt.) Ltd. Karachi - Pakistan
Principal representative of
Magnetic Technologies LLC UAE

Understanding Water and its Environment

- Water needs help. For it to naturally maintain its balance and purity it requires oxygenation, movement and circulation within fixed bodies of water such as lakes and ponds. Allow it to lay dormant and it will stagnate; algae takes hold, the turbidity deteriorates, infestations of mosquito larvae take hold and odours become repugnant.
- Water is complex yet dynamic. It withstands being mistreated and polluted. It manifests itself in the most unlikely of locations and also survives in the most harsh of environments.
- The majority of the earths' fresh water is frozen in our icecaps or indeed hidden below ground.
- Most of our water used within urban environments is recycled several times
- Consequently, along with any recommendations of magnetic device installations, Magnetic Technologies will equally review the natural mechanics of the water body and will identify deficiencies and make suggestions to enhance the overall water body environment and its functionality.
- If you can not contain or reduce adverse actions upon the water, fail to recognise waters basic requirements, then expectations will be lower or indeed results will take longer.
- Re-booting the structure of water and its environment is a 'process' and not an overnight event. This 'process' goes through a cycle of visual and materialist events, often looking worse for periods whilst factors realign, algae dies off and good bacteria re-establish.

The Technology

- Russian Scientific development from 60s to 90's, with 50 institutes and 500 scientists in the 80's headed by Prof Yuri Tkatchenko who since relocated and created Magnetic Technologies LLC UAE in UAE in 1995 with Sheikh Junaid Khoory
- Proven highly effective and cost efficient within numerous sectors
- Based on using permanent magnetic fields in order to influence charged water particles by a Lorentz force.
- A change occurs in the structure of the water without altering its physical state, acquiring significant enhancement in its properties in addition to it becoming structured.
- No Chemicals are required.....No additional power source needed

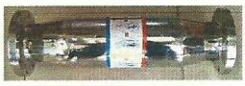
Water Property Expectations

Some changes of water properties as a result of treatment are acceleration of:

- Viscosity by 3-4%
- Surface Tension by 10-13%
- Electric Conductivity by 7-26%
- Specific Heat Capacity by 3-4%
- Latent Heat by 10-40%
- Magnetic Susceptibility by 200-400%

Some changes in operational requirements:

- reduced and potential elimination of chemical reliance
- reduced maintenance and deterioration of filtration systems



Results: visible one week after the installation

- A significant increase in the efficiency of industrial processes:
- accelerates flocculation, coagulation, sedimentation and filtration processes
- increases efficiency of extraction
- reduces corrosion processes
- reduces growth rates of mineral and biological sediment
- individuals and companies benefit from lower operating costs and lower energy consumption

Natural Waters Expectations

Lakes, Rivers, Sea Lagoons, Ponds Including Fresh Water, Ground Water & TSE Expectations

After treatment the following changes occur:

- renewal of natural biological processes
- improvement of water biosphere
- elimination of bad odours
- increase in fish production as a result of lower death and disease rates
- improves ecology around the area

Wastewaters within treatment plants expectations

- intensify clarification processes (i.e. lighter in colour)
- reduce formation times of flakes and coagulation of the suspended solids
- Intensify purification due to the finer weighed particles being more easily detected by filters
- decrease corrosive activity of wastewaters
- significantly reduce fermentation time of organic material
  increase the level of sediment density
- dramatically reduce chemical usage, eliminating many chemical needs all together
- increase levels of extraction of dissolved hydrogen sulfide from water
- significantly reduce pathogenic bacteria
- increase efficiency of treatment plant

The Challenges within Water Management

We experience numerous types of challenges within clients lakes It necessary to understand the ecosystems and the importance of enhancement by Magnetic Technologies

Algae growth

Algae influence the water quality of the pond, mainly by affecting the balance among dissolved oxygen, pH, carbon dioxide and nutrients. During photosynthesis, algae produce oxygen, remove nutrients and take up respired carbon dioxide from both the fish and the algae itself. In heavily stocked ponds, the water becomes supersaturated with carbon dioxide. High levels of carbon dioxide can quickly depress the pH of the water to levels below seven if the pond is not carefully maintained with proper alkalinity levels and adequate aeration for stripping. During active periods of photosynthesis (during daylight hours), algae can quickly strip the carbon dioxide out of the water and pH levels can rise above nine in a matter of hours. Fish which are not acclimated to such sharp shifts may initially show signs of stress and potentially die.

At night, both algae and fish consume oxygen from and exhale carbon dioxide into the system. Algae compete with the fish for available oxygen in the water. A potentially serious impact of an algae bloom is the risk of an "algae crash" triggered by temperature or barometric pressure. When an algae bloom collapses, dead algae cells settle to the bottom of the pond adding to the decomposing sediment's oxygen demand. If the crash is severe, the pond's oxygen supply can be quickly depleted, endangering the fish, unless backup aeration is available. Additionally, as the dead algae cells rupture, they can release organic nitrogen and phosphorus back into the water adding to the system's nutrient load. The biological cycle starts again with bacteria converting the organic nutrients to inorganic elements. Which are then available to be recycled, and the algae bloom continues.

Magnetic application provides the necessary positive continuity within the eco system

Common Micro-organisms in ponds

Bacteria is a large group of single celled organisms that are found in every corner of the earth, be it land, air or water. There are approximately 5×1030 bacteria on the earth that form a major part of the biomass. These are prokaryotes that lack a nucleus and membrane bound organelles. They come in different shapes and sizes.

Proteobacteria and **Actinobacteria** negative gram cells are mostly anaerobic and heterotrophic and contribute a lot to decomposition of waste suspended in the water and deposited in the sedimentary floor. Proteobacteria flourish in eutrophic ponds and include phototrophs, pathogens, and fecal bacterial indicators of contaminated water. They can be found suspended in all layers of the pond. Fecal indicator bacteria are bacteria used to assess the quality of a water source.

Protozoa commonly range from 10 to 52 micrometers, but can grow as large as 1 mm, and are seen easily by microscope. The largest protozoa known are the deep-sea dwelling xenophyophores, which can grow up to 20 cm in diameter. They were considered formerly to be part of the protista family. Protozoa exist throughout aqueous environments and soil, occupying a range of trophic levels.

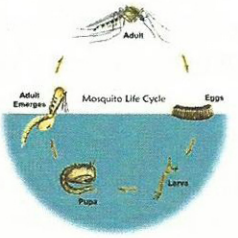
Magnetic treatment contributes to a healthy water environment for beneficial bacteria

Insect infestation [especially mosquitoes]

General insects:

Ponds are housing grounds for myriads of insects like mayflies, water bugs, water scorpions, etc. Scores of insects enter into this world through ponds and some of them even live all their lives in ponds (adapted to living in water), whereas others live their larval and nymph stages in these ponds until and leave the pond on reaching adult stage. Pond insects feed on larvae of other insects found in the pond, decaying vegetation and algae. Each insect species is well-adapted to surviving in the aquatic environment, and the characteristics of each species is unique.

The Mosquito life cycle:



Mosquito larvae consume microorganisms and organic matter in water. Mosquitoes prefer stagnant water within which to lay their eggs. They most commonly infest ponds, marshes, swamps and other wetland habitats. Water that has been stagnant for three days is a prime habitat for mosquitoes. Hot, humid environments are most amenable to mosquito growth and survival. The *Anopheles, Culex, Culiseta, Coquillettidia* and *Uranotaenia* species breed in permanent bodies of water and can survive in polluted water as well as freshwater, acid water and brackish water swamps.

Source reduction means elimination of breeding places of mosquitoes. It includes engineering measures such as filling, leveling and drainage of breeding places, and water management (such as intermittent irrigation). Source reduction can also be done by making water unsuitable for mosquitoes to breed, for example, by changing salinity of water.

By Magnetising water, especially within lakes, pond, water courses and TSE storage prevents the abundant larvae survival and transforms its necessary habitat, making it an unsuitable environment for the manifestation of the mosquito, but enhances the water for positive balance of insects such as mayflies.

Threats to fish [sudden losses]

General cause:

Low oxygen levels in water often lead to *mass* fish *deaths.*

Sludge in the water when treated by bacteria; these bacteria convert these resulting organic acids into acetic acid, along with additional ammonia, hydrogen, and carbon dioxide. Acetic acid creates a shift in the pH of the water; extreme acidic condition of water creates a uncomfortable condition for fish to survive.

Methanogens convert these products to methane and carbon dioxide. Along with ammonia these gases become toxic and will increase fish mortality.

Sludge, depending on its source, itself contains toxic waste, that are harmful for the fish growth.

Fish relationships with other fish

Giant snakeheads feed on Tilapia and it is found to be an effective tool, when cultured in ponds in combination with **Tilapia**, in controlling the overpopulation of tilapia and thus checks the stunted growth of **Tilapia**.

Adult Arowanas may show dominance and aggression. Some compatible species often partnered with this fish are clown *knifefish, pacu, oscars, plecostomus, jaguar cichlids, green terrors, gar, tinfoil barb, siamese tigerfish,* and any other semi-aggressive fish that cannot fit in the arowana's mouth.

Asian Arowanas are more aggressive than American, so with Giant Snakeheads, American Arowanas cannot survive without stress.

Cat fish and **Arabian killifish** (Aphanius dispar) are harmless.

Odours and repugnant Smells

Odours are caused by the evaporation of a water surface or of moisture upon any surface. The evaporating moisture carries the small particles of the original substance that generate the smell. Algae and discarded pollutions and sewerage and chemicals are typical substances within amenity water features that cause smell. Stagnated waters and high saline solutions which kill the ecology creating decomposing plant and fish life also creates extreme smell.

By Magnetising water pretreatment suspended pollutant particles drop to the water bed, eliminating dispersion of smells through evaporation from the water surface.

Red Tide [HABs]

Red tide is a colloquial term used to refer to one of a variety of natural phenomena known as a *harmful algal blooms* or *HABs*.

The term *red tide* specifically refers to blooms of a species of dinoflagellate known as *Karenia brevis*. *K. brevis* will move in the direction of greater light and against the direction of gravity, which will tend to keep the organism at the surface of whatever body of water it is suspend within.

Mobility

They have two flagellum one longer than the other. The larger moves in a whip like manner and propels the organism forward and the other flagellum acts as a rudder to steer the organism in the direction it wishes to travel.

Needs

Karenia brevis, needs three components to form a bloom.

- The first is biology, the organism must be present in the water.
- The second is the correct chemistry, nutrients that it needs to grow primarily nitrogen (N) and phosphorus (P), sufficient to support high biomass blooms of the red tide dinoflagellate, *Karenia brevis*, has remained problematic [1].
- And the third component is the right physical conditions have to be right, especially favourable include warm surface temperatures, high nutrient content, lower salinity, and calm seas.

Rain followed by sunny weather in the summer months is often associated with red tide blooms.

Danger

K. brevis, produces brevetoxins that can affect the central nervous system of fish and other vertebrates, causing these animals to die.

Wave action can break open K. brevis cells and release these toxins into the air, leading to respiratory irritation.

The red tide toxins can also accumulate in molluscan filter-feeders such as oysters and clams, which can lead to Neurotoxic Shellfish Poisoning in people who consume contaminated shellfish.

Solution

Magnetic Treatment can potentially limit the ammoniacal nitrogen content available to *K. Brevis,*
Magnetized water changes the growth condition of algae by oxidizing the water.

K. brevis, prodRef: [1] Continental Shelf Research, Volume 28, Issue 1, January 2008, Pages 73–98

Necessity and Benefits of a Good Ecological System

Benefits of Plant Life

Plants in ponds play a vital role in pond ecosystems. Pond plants can be roughly divided into three main categories: submerged, emergent, and floating. Each group of these plants for ponds provides different general functions within their environment.

Submerged plants are those that are completely underwater and they help add oxygen to the water, provide cover for a variety of small animals from invertebrates to small fish.

Eg. Hornwort.

Emergent plants are those which are rooted underwater and whose leaves and/or flowers break the surface of the water. This group provides food and cover for small fish, amphibians, birds and even small mammals.

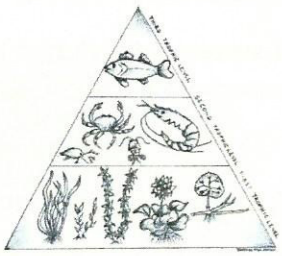
Eg. Grass, Cattails

Floating plants are those which float freely on the surface of the water. This group of plants helps provide shade for the pond during warmer times of the year (helping regulate water temperature) and also can provide a source of food for waterfowl and fish species.

Eg. Water lily, Duckweed.

Planting species from all three categories helps to create a sustainable pond ecosystem that works together to provide the most benefits for aquatic life. Besides aquatic life plants are helpful for birds as feeding ground.

Magnetised water enriches the balanced water environment for healthy planned plant life



Benefits of fish in ecosystem

Fish are heterotrophic organisms consume autotrophic organisms and use the organic compounds in their bodies as energy sources and as raw materials to create their own biomass. Fish, besides giving a pleasant and lively look to the lakes, helps to keep the aquatic life under control by controlling the population of lower organisms as insects, phytoplankton and zooplankton. Small fish serve as food to higher fish organisms and birds.

Magnetised Water creates a proliferation of Fish, creating an evenly oxygenated environment

Benefits of Amphibians:

- Amphibians like frogs, toads play a pivotal role in pond ecosystem as secondary consumers in many food chains. They fill a critical role both as predator and prey species.
- Tadpoles have significant impact in nutritional cycling. They are herbivorous to omnivorous and are the prey items for both invertebrates and vertebrates.
- Adult amphibians are the best biological pest controllers. Invertebrates and vertebrates also predate them. Because of their importance in ecosystem, decline or extinction of their population has significant impact on other organisms along with them.

Amphibians are regarded as good ecological indicators. Due to high degree of sensitivity, either during tadpole stage or as adults, they respond to very slight change in the environment. Such responses have been used to indicate habitat fragmentation, ecosystem stress, impact of pesticides, and various anthropogenic activities.

Magnetised Water provides a balanced and enhanced eco system for Amphibians

Magnetic Technology LLC Projects

We have completed and have ongoing projects across many parts of UAE and the globe.

- The Dubai Municipality have engaged us to address several contaminated amenity and irrigation lakes
- Golf Course Complexes with amenity and irrigation lakes
- Private developments with water features and lagoons
- Fountain features
- Water treatment facilities

Emirates Golf Club
Dubai, UAE 2009 onwards

- Prior to installation:

" ...Significant algae formation and a bad smell around the lake, which caused complaints from golfers and residents..."

- After installation:

"...Since installation the algae problem has reduced and the smell disappeared.."

Christopher May General Manager
Emirates Golf Club

"Prior to this installation we had massive complaints from the Hattan Villa residents with regards to smell and from our members and guests with regards to both odor and the look of the lake [.....] I was the biggest skeptic when going down this road but have to admit that the results have converted me [.....]we are now in discussions re an ongoing maintenance plan for our properties".

Craig Haldane
Director - Golf Course Maintenance
Dubai Golf

Sea Lagoon, Private Palace of Sultan Muscat, Oman 1996

- Prior to installation:

"Concerns over murky water, bad smell, low visibility and lack of fish".

- After installation:

"Magnetic fountain has transformed the lagoon. Waters are clear, bad smell is gone and fish numbers have significantly increased. As a result, there are more birds around the area".

Private Office Correspondence

Natural Lake Moscow, Russia

- Prior to installation:

Local residences complained of bad smell and green unclear water.

- After Installation:

After just 24 hours the smell has disappeared and water became clear. While samples revealed many water parameters have been changed, e.g. Total Bacterial Count decreased from 1300-590/1 ml and Coliforms decreased from 32000-620/100 ml.

Analytical Center of Water Quality "ROSA", Moscow, Russia

Artificial Pond Moscow, Russia

No.	Parameter	Unit	Standard	Before Treatment (07/07/09)	After Treatment (08/07/09)
1	p.H.	-	6.5-8.5	6.4	7.5
2	Color	-	-	Green	Clear, colorless
3	Suspended Solids	mg/l	0-10.75	244	<3
4	Dissolved Oxygen	mg/l	>4	6.67	7.62
5	BOD_5	mg/l	0-2	6.32	2.89
6	Petrochemicals	mg/l	0-0.1	0.13	0.03
7	Total Bacterial Count (22C°)	per 1 ml	-	3200	310
8	Total Bacterial Count (37C°)	per 1 ml	-	1400	190
9	Total Coliforms	per 100 ml	0-500	300	210
10	Total Thermotolerant Coliforms	per 100 ml	0-100	180	140

Physical-chemical analysis for water samples 1-6 was carried out by "Mosvodostok" Laboratory, Moscow, Russia; for samples 7-10 carried out at Analytical Center of Water Quality "ROSA", Moscow, Russia.

Dubai Municipality 2012 onwards

Government of Dubai Zabeel Garden Lake

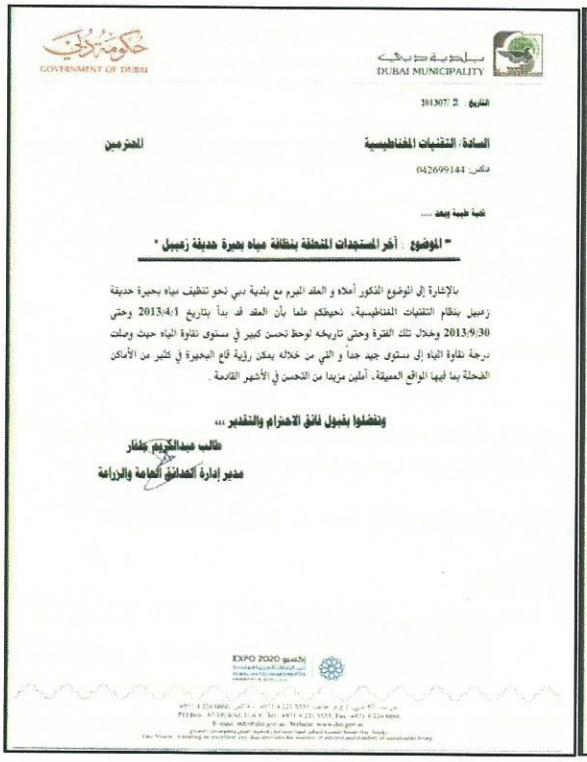
*Written quote:....."*the contract started on the 1-4-2013 ....upto date [2-7-13] it was noticed a high development in the level of the purity of the water, as the grade and level of purity of the water reached a good level, so that it is [now]possible to see the bottom of the lake in many shallow and deep locations...."

Talib Abdul Kareem Jalfar

Director of the Administration of Public Parks and Agriculture

Zabeel Lake *"Municipality original letter"*

BEFORE



حكومة دبي
GOVERNMENT OF DUBAI

بلدية دبي
DUBAI MUNICIPALITY

التاريخ : 2013/7/1

السادة : التقنيات المغناطيسية
042699144 :فاكس

المحترمين

تحية طيبة وبعد ،،،

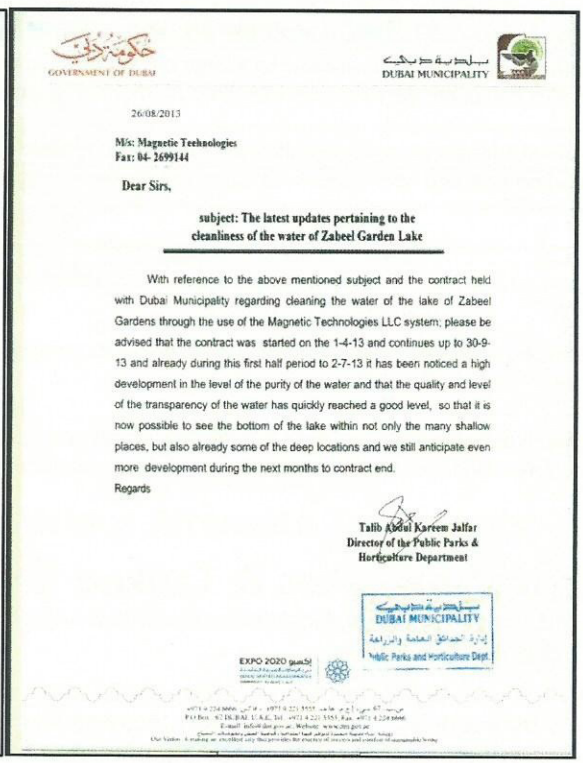
الموضوع : آخر المستجدات المتعلقة بنظافة مياه بحيرة حديقة زعبيل "

بالإشارة إلى الموضوع المذكور أعلاه و العقد المبرم مع بلدية دبي نحو تنظيف مياه بحيرة حديقة زعبيل بنظام التقنيات المغناطيسية، نحيطكم علما بأن العقد قد بدأ بتاريخ 2013/4/1 وحتى 2013/9/30 وخلال تلك الفترة وحتى تاريخه لوحظ تحسن كبير في مستوى نقاوة المياه حيث وصلت درجة نقاوة المياه إلى مستوى جيد جداً و التي من خلاله يمكن رؤية قاع البحيرة في كثير من الأماكن الداخلة بما فيها المواقع العميقة، أملين مزيدا من التحسن في الأشهر القادمة .

وتفضلوا بقبول فائق الاحترام والتقدير ،،،

طالب عبدالكريم جلفار
مدير إدارة الحدائق العامة والزراعة

EXPO 2020 إكسبو



حكومة دبي
GOVERNMENT OF DUBAI

بلدية دبي
DUBAI MUNICIPALITY

26/08/2013

M/s: Magnetic Technologies
Fax: 04- 2699144

Dear Sirs,

subject: The latest updates pertaining to the cleanliness of the water of Zabeel Garden Lake

With reference to the above mentioned subject and the contract held with Dubai Municipality regarding cleaning the water of the lake of Zabeel Gardens through the use of the Magnetic Technologies LLC system; please be advised that the contract was started on the 1-4-13 and continues up to 30-9-13 and already during this first half period to 2-7-13 it has been noticed a high development in the level of the purity of the water and that the quality and level of the transparency of the water has quickly reached a good level, so that it is now possible to see the bottom of the lake within not only the many shallow places, but also already some of the deep locations and we still anticipate even more development during the next months to contract end.

Regards

Talib Abdul Kareem Jalfar
Director of the Public Parks & Horticulture Department

DUBAI MUNICIPALITY
إدارة الحدائق العامة والزراعة
Public Parks and Horticulture Dept.

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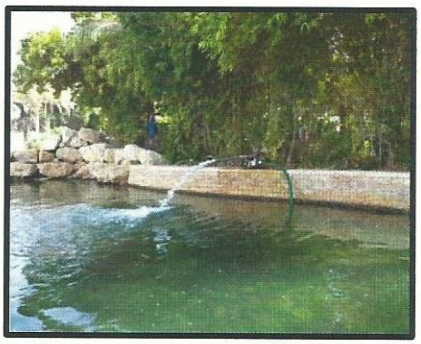


AFTER

Magnetic Technology Enhancements

Fountains

Types:

- •Tall feature fountains
- •Low level diffusers
- •Amenity

Magnetic system instalment does not interfere with the already existing technical construction. Magnetic system is installed as a cover/"hat" in front of the water filter.

Advantages:

1. Increase of power coefficient of engine output, which occurs due to the increase of water's fluidity and sorting out of clusters. This results in the increase of a fountain's height by 15-20%.
2. Magnetic water, which flows into the water-pipes and water pumps, destroys incrustation (salt deposition) in these systems and prevents its future formation.
3. Water changes its physical, chemical and biological properties, that can be seen very clearly if we are to compare lab result of before and after installation of magnetic systems. Also, water becomes visually transparent and its flora increases. These changes are due to a large decrease of pathogenic bacteria in the water and coagulation of weighed particles and other various chemical compounds (their deposition on the lake's bottom).

The most suitable place for installation of magnetic systems to the running fountain is the water pipeline. The system should be installed before the water pump as shown on the picture below.

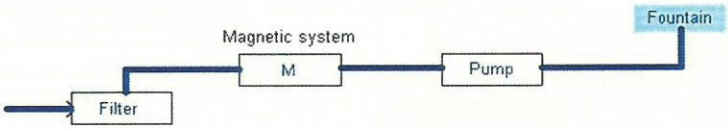


Fig. 1

Therefore, the choice of a magnetic system depends on the diameter of water pipe-line that supplies water to the pump.

Ionised Fountain waters vapours significantly contribute to air quality improvements and by the dissolution of air pollution within the immediate vicinity, providing an environmentally friendly bye product to water treatment

Irrigation Lakes & Tanked Supplies

Golf courses, Parks, Hotels and Malls and Amenity Gardens

By magnetising the flow of waters into and from irrigation sources it has been demonstrated that there can be significant enhancement of grown plant life;

- • increasing resilience to disease;
- •reducing affects of extreme temperature;
- •requiring reduced fertizers, pesticides, herbicides and chemical additives;
- • improving appearance, yields, taste and crop production cycles;
- •reduces the individual water requirement of plants , trees and grasses;
- •dissolves saline and mineral crustation within the soil and infrastructure;
- •Transforms TSE waters to environmentally acceptable standards

This is in addition to the improvement of the stored water, removing algae and suspended sediments and odours

Mosquito Elimination

When infestation of mosquitoes is prolific around water amenities, then by Magnetising water, within lakes, ponds, water courses and TSE open storage for irrigation, this prevents the mosquito larvae survival, by transforming its necessary habitat, by altering stagnated water structure, dropping suspended pollutant food particles, thus eliminating manifestation of the mosquito.

Magnetic systems eliminate the alternative option of pesticides, costing thousands of dollars per month to control medium sized public amenity lake environments.

Fish Enhancement

- Magnetising the waters evenly distributes oxygen, breaking molecule clusters. Fish are attracted to and thrive in oxygenated fresh and saline waters, even up to 60,000ppm.
- Suspended pollution drops providing better visibility
- Natural beneficial ecology improves for feeding fish
- Health of fish improves growing faster and larger
- Resilience to disease improves
- Fish stock increases

Permissible limits of ponds for Fish growth		
Physical properties	**Unit**	**Limits**
pH		7.2 to 8.5
Dissolved oxygen	mg/L	8 mg O_2 at water temperature 70°F (21°C).
Temperature	°C	20 to 35
Salinity	mg/L	3000 to 4000
EC	µS/cm	5600 to 7300
Ammonia	mg/L	<0.5
Nitrite	mg/L	<0.25
Chloride	mg/L	1600 to 2214

Attributes And Dangers Of Various Alternate Treatments

UltraSound Technology [designed for inline sanitised requirements]

Attributes & limitations

The United States Army Corps of Engineers researched Ultrasound suggesting that it can be effective in wastewater treatment in combination with chlorine[2],

- when tested for open lake treatment it has been proven non effective on filamentous algae and vascular aquatic plants[1];
- additionally they suggest that Ultrasound waves bounce off hard surroundings and dense beds of submersed aquatic weeds also reduce signal strength;
- it is also suggest that large and irregularly shaped bodies of water require multiple installations; and
- Ultra Sonic is limited in large open bodies of water; and
- is limited in flowing water reducing US affect due to required exposure of 4 to 5 weeks to destroy the algae cells.
- Massive' immediate vicinity' die-off and/or decay of algae in a short term may result in low dissolved oxygen levels in some systems, potentially harmful to ecosystems.
- **A warning** is that Human exposure to ultrasound in excess of 30 kHz may lead to hearing loss, with 38 kHz producing hearing defects, and exposures above 45 kHz may lead to death[3]. It has also been acknowledged that birds reproductive systems are adversely affected by US [1](Phull et al. 199) [2](SonicSolutions LLC,2011) [3](AGNIR, 2010)

MagTech does work with UltraSonic 'Lazuur' products for purification of water from high end pathogens, required with hospitals, food processing and swimming pools, fitting magnetic inline devices to reboot the destroyed molecular structure post treatment.

Antibacterial water treatment methods

The widely used antibacterial water treatment methods were:

- Chemical method- chlorination and
- non-chemical method-copper and silver ions.

Both methods are proved to posses effective antibacterial effects. But has limitations too.

Effect of Chlorine:

- Inhalation of chlorine in high concentrations is very toxic, can cause death.
- Can cause severe irritation of the nose and throat.
- Can cause severe lung injury.
- Can cause life-threatening accumulation of fluid in the lungs (pulmonary edema).
- Chlorine's damaging effects on hair are well known,
- few people realize the links of inhalation of the chemical by swimmers to increased asthma
- Further, in an unpleasant reaction, urine and sweat in water can react with chlorine to form toxic breakdown products known as chloramines.

Effect of Copper anodes:

- Long-term exposure to copper can cause irritation of the nose, mouth and eyes and
- it causes headaches, stomach aches, dizziness, vomiting and diarrhoea.
- high uptakes of copper may cause liver and kidney damage and even death.

Whether copper is carcinogenic has not been determined yet, but Soluble copper compounds form the largest threat to human health.

Use of Bacteria and Micro-organisms in water purification

Overview

Microorganisms can play a major role in decomposing waste organic matter, removing carbonaceous BOD, coagulating non settled colloidal solids, and stabilizing organic matter. These microorganisms convert colloidal and dissolved carbonaceous organic matter into various gases and cell tissue. The cell tissue, settles as sediment (Liu and Liptak, 1999)

Types

In the treatment of wastewater three types of overall processes are distinguished to represent the conversion of organic wastes by microorganisms.

- aerobic, micro-organisms utilize oxygen to oxidize organic substances to obtain energy for maintenance and the synthesis of cellular material
- anaerobic the microorganisms utilize nitrates, sulphates and other hydrogen acceptors to obtain energy for the synthesis of cellular material from organic substances
- photosynthetic (Spellman, 2000).

Process

Saprophytic bacteria convert dissolved organic impurities into living cell mass, carbon dioxide and water. These saprophytic bacteria may then be eaten by flagellates and ciliates which also consume suspended organic particles including viruses and pathogenic bacteria. Clarity of the water may begin to improve as the protozoa are subsequently consumed by rotifers and cladocera.

Species

Some bacterial species known to posses water purifying capabilities were, Alcaligenes, Bacillus, Beggiatoa, cyanobacteria, Flavobacterium, Pseudomonas, purple sulphur bacteria, Sphaerotilus.

Warning

Treatment with micro-organisms should be monitored and maintained under strict control. Growth of micro-organisms out of control may cause negative effects. Microorganisms are significant in water and wastewater because of their roles in disease 'transmission' and in biological treatment processes. Considerable knowledge of the microbiological characteristics of water and wastewater is essential prior to application (Spellman, 2003).

Quaternary Ammonium Compound (QAC) "Zoono"

Attributes:

Zoono is a product trade name for the Quaternary Ammonium Compound [QAC] The working principle of QAC is that microbial cells generally carry a negative net charge at the surface due to their membrane proteins, teichoic acids of Gram-positive bacteria, and negatively charged phospholipids at the outer membrane of Gram-negative bacteria. This way, polycations are attracted and if they have a proportionate amphiphilic character, they are able to disrupt the outer as well as the cytoplasmic membrane and create lysis [breakdown] of the cell resulting in cell death The QAC offers relief to normal usage of chemicals for treatment of antimicrobial and anti-algal threats and these compounds do not have any known negative impacts on environment and health aspects.

Limitations:

However QAC [Zoono] does not prevent the microbial or algal infestation with regards to open water systems. As it acts only on contact with the organisms, and QAC is fixed to a solid medium or within filtration elements. Consequently if the organisms do not come in contact with the QAC, they remain unaffected. so it acts as a cure, rather than prevention; therefore the Solution for bodies of water is to circulate the water through a medium containing QAC, so that the organisms in every part of water body make contact with QACs. To date there is no proved inhibition activity of QAC against filamentous algae. Research continues.

Chemical Challenges

Chlorine (Cl_2) is a corrosive, poisonous gas used to make bleaching agents and disinfectants. The form of chlorine most often added to pool water is solid calcium hypochlorite which forms hypochlorous acid (HOCl) when placed in water and is the effective agent that controls algae growths in pool and is used as a water treatment to kill bacteria...however

Inhalation: if inhaled in strong doses, it can cause death. Or cause severe irritation of the nose and throat. leading to severe lung injury. It can also cause life-threatening accumulation of fluid in the lungs (pulmonary edema). Symptoms may include coughing, shortness of breath, difficult breathing and tightness in the chest. Symptoms may develop hours after exposure and are made worse by physical effort. Long-term damage may result from a severe short-term exposure. A single exposure to a high concentration can also cause a long-lasting condition like asthma

Algacide are basically toxins that prevent the growth of algae in water bodies.

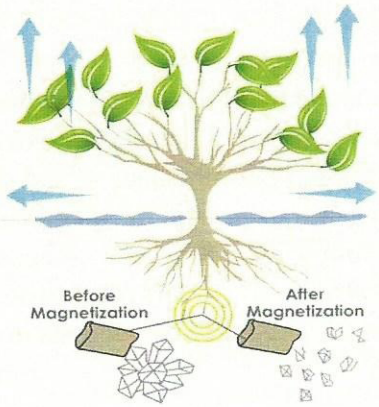
Anti algal dyes were used to suppress the growth of algae in water bodies. By spreading colour of different wave length this prevent the photosynthesis of algae, eventually supposedly killing the organism.

Warning: Toxins and Dyes generally are capable of sustaining damage to human health. The effects range from simple skin rashes to adverse and fatal tumours.

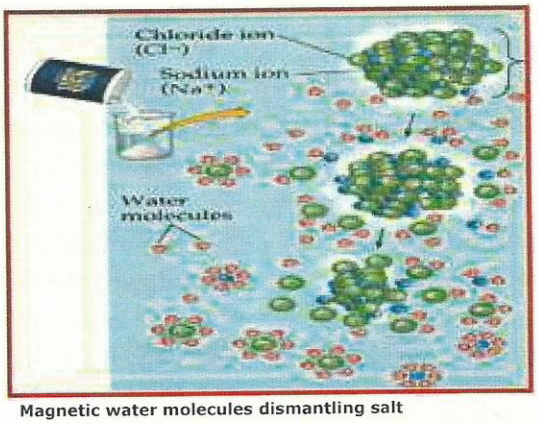
Additional Benefits of using the Magnetic Water Treatment System

Brackish water: [saline contaminated water] is a challenge within most environments, especially if it infiltrates irrigation water systems. Also salinity in water creates corrosion within pipe and pump infrastructure. Normal acceptable levels are below 2000ppm. often normal ground water is up 7000ppm and deeper ground water can be in excess of normal sea water over 50,000ppm, which potentially will do great harm to golf courses fairways and greens and general plants within parks.

By Magnetising brackish water we can change the physical properties of the salt within the water, preventing it from crystallising, maintaining a totally soluble state. This can not only be absorbed by plants when up to 7000ppm , but the brackish water carries more nutrients than normal sweet water. Plus when magnetising solutions of over 7000ppm we can safely integrate within TSE lake supplies and general irrigation water feeds. Thus lowering water supply costs and reducing infrastructure maintenance.

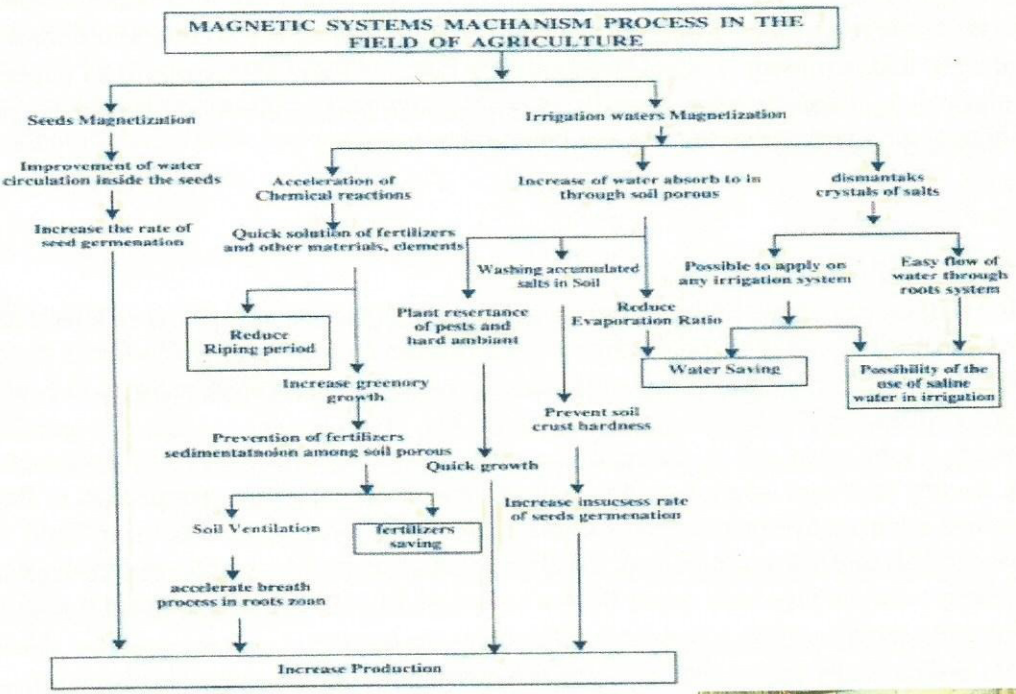


Benefits to Plants



Magnetic water molecules dismantling salt

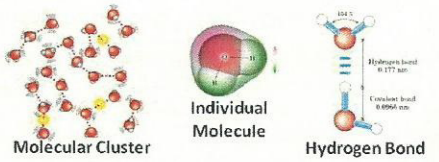
Benefits to Irrigation and Agriculture from Magnetic Technologies



Magnetic Technologies can provided devices for all applications from small to very large capacity, from PVC to Stainless Steel and if necessary design a bespoke device to suit

The Technology

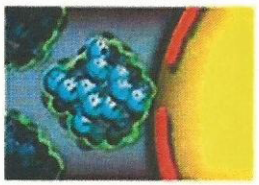
Understanding The Magnetic Affect Upon Water



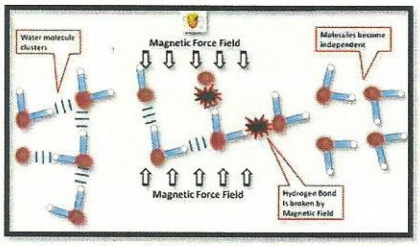
Water Molecular Structures prior to magnetism

Magnetism Process

During the process of magnetic induction and in conjunction with the speed of the water through a magnetic device, there is an effect of *magnetohydrodynamic resonance* [vibration]. Between the *Lorentz force's* frequency and the *'natural vibrations'* of water, there initiates a *second order phase transition* – a change in the structure of water without changing its physical state, during which the Hydrogen Bonds are broken, dismantling molecule clusters, releasing the individual molecules

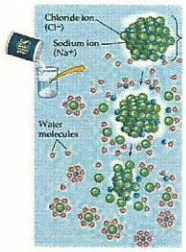


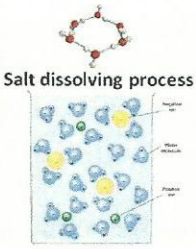
Non –Magnetised water clusters have difficulty passing though cell the wall

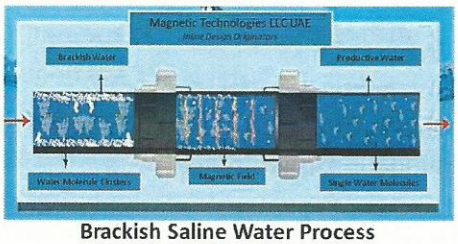


Fresh Water Process

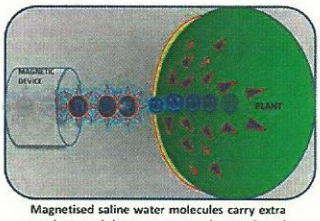
Magnetised water molecules pass through the cell walls more easily







Brackish Saline Water Process



Magnetised saline water molecules carry extra nutrients and does not create salt crystals and thus penetrates more easily through the plant cell walls providing extra benefit to the plant

Within water, the consequences of breaking the molecular bonding offers a variety of advantages; including a more and even and wider distribution of the individual molecules beneficial to fish; because the molecules are now acting alone, they are unable to suspend heavier pollutant particles; thus improving the turbidity; thus removing the evaporating odours; and consequently improving the surface ecology; limiting the ability of mosquitoes to breed. This in turn reduces the need for chemical treatment; reduces the opportunity for algae to grow and improves the overall appearance of a natural environmentally friendly lake or water course system.

How we work

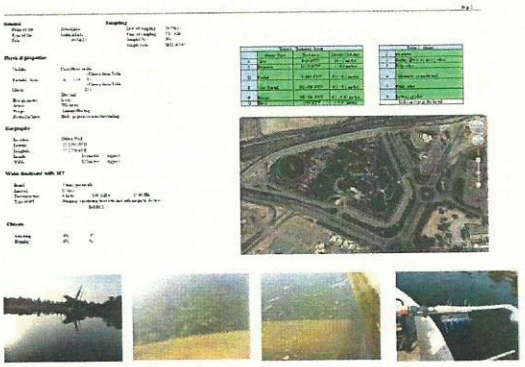
Before we embark on any water treatment exercise, we would request some water facility information

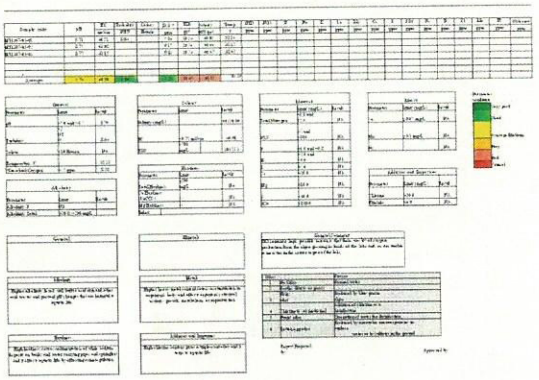
1. Informal meeting on site or in office or by Skype
2. Completion of our questionnaire / data collation
3. Supply of any water analysis if available using our Analysis report document.
4. To provide some pictures of the water facility, the inlet[s] the outlets, the source of the feed and the water condition, the algae, plants and water visibility etc if we can not visit the site.
5. Supply a location map [Google] etc
6. Explanation of history of water problems
7. Long term intentions
8. Understanding of the adjacent lands water useage

This will help us advise you on the type of treatment necessary for each specific water facility and help us to put a briefing together to support our representatives and create a presentation document to the client.

The Process

1. **Assessment of the water environment**
   Magnetic Water Analysis Data Presentation

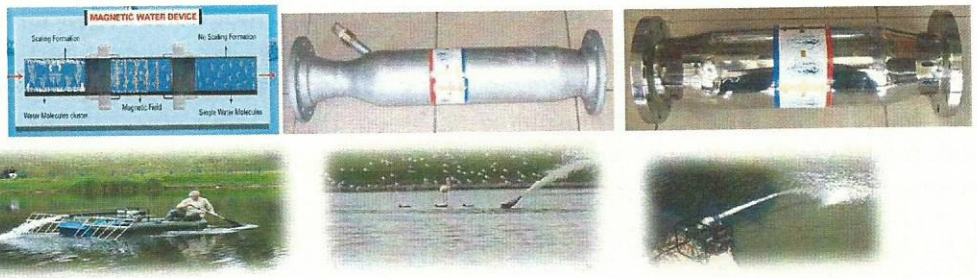




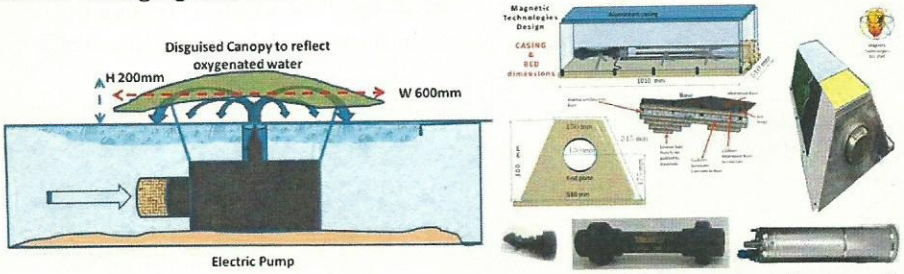
Reviewing:

- water supplies and top ups
- cluster discharges
- industrial discharges
- TSE infiltration or managed supply
- surface water run-off and storm water inundation
- sewerage inundation infiltration

2. Technical Proposal based upon inspection analysis
3. Initial proving ; with agreed fee subject to success of proving; expectations set.
4. Installation of a permanent MT devices within the system with a water management plan:



- magnetic systems on water vessels (i.e. for intensive and periodic use)
- use of artificial water pumps (e.g. fountains, occasional stand alone shore systems)
- installation of lake floor horizontal circulation pumps
- use of existing diffuser systems infrastructure upgraded with MT devices
- use of natural water flow
- considered use of bespoke filtration systems
- review needs for dredging and sediment removal



5. Result monitoring and continued water analysis with potential treatment adjustments
6. Business Model options; commencement upon full operations
   - Water management contracts
   - Equipment leasing
   - Provision of Continued water analysis facilities

Treatment might include:

2. MT devices on the inlets
3. MT devices on water fountains/ jets
4. MT devices in pump /filter rooms
5. Bespoke MT designed lake floor circulation pumps
6. Bespoke MT designed surface low level surface diffusers.
7. An MT boat system with circulatory pumps operating periodically once per week, two weeks or per month. Boat systems vary in size above a certain size of lake/pond.
8. Use of shore side stand alone circulatory MT pumps in addition to or instead of boats systems
9. We might suggest additional compressors to add to our special devices
10. The Initial few months may need to be intense treatment, relaxing to inlets/ fountain devices after only.
11. Treatment also depends on whether the client wants a maintenance contract ongoing,
12. or just a short term intense treatment, followed by lease/ purchase of MT inline devices.

Notes For Setting Water Analysis Parameters

FOR TREATING TSE / RIVER INUNDATION WATERS CONTAINING TREATED EFFLUENT DISCHARGE

- Water quality parameters assured by MT is highly dependent on the quality of TSE
- Total Nitrogen and Total Phosphorous are the key elements for creating Algae. Their levels along with the COD are dependent upon the TSE levels.
- The TSE will be analysed by MT and we recommend that the quality of TSE complies with the guidelines/laws set by local governing bodies.

BRACKISH WATER/GROUND WATER/FRESH WATER

- Total Nitrogen and Total Phosphorous remain the key elements for creating Algae.
- Salinity of the water will not be altered by MT. However water property is changed so that it does not affect the aquatic life.
- Any drainage of irrigation water that may contain fertilizers can increase the source of Total Nitrogen and Total Phosphorous content in water.
- Challenges with hard water scaling where eliminated by use of MT will create no change in the chemical analysis of hardness, as the components creating hardness are transformed to a non-scaling state rather than being decreased, although existing scale will slowly dissolve.

GENERAL PARRAMETERS

- Magnetising the water whilst eliminating the algae, will not necessarily reduce the actual chemical properties for analysis, consequently the achieved physical and visual results will not necessarily reflect the parameter limits of chemical components of water.
- It will be noted that our MT treatment process increases the DO which replaces other unwanted dissolved gases, including nitrogen and ammonia.
- We work on the principle of improving water quality structurally rather than altering the chemical components of the water.
- Within Total Nitrogen by magnetising the waters we can reduce the Organic Ammonia, which is the major component of Total Nitrogen that energises algae growth and is the primary base for initiating unpleasant odours.

- **CONSEQUENTLY:** Quantifying our results primarily relies upon observations of us improving the visual amenity, eliminating odours, reducing chemical needs, eliminating algae growth, eliminating mosquito infestation, increasing fish stock, improving the health of the ecological environment, improving the water quality structurally without any significant change to the chemical components. We will however continue to support all of these achievements with detailed water analysis reports.

Prior to start

Prior to all potential water treatment and enhancement projects for outside water resources we request basic information for us to appraise the options to understand the your aims and challenges

MAGNETIC TECHNOLOGIES LLC

SITE VISIT/REQUEST QUESTIONAIRE

Site Ref & Country :		Date :	/ /2013
Type of Site :		Future water type :	
Present site use :		Intented site use :	

Please √ (Tick) and/or fill the appropriate boxes + additional comments if any at page bottom.

1 Appearance

a: Odour :

	No odour
	Earthy, Musty or grassy odors
	Fishy odor
	Chlorinous, or medicinal
	Fruity odor
	Rotten egg odor

b: Presence of Algae :

	No algae
	Slight growth
	Medium growth
	Flourishing growth
	Dense growth
	Decaying

c: Colour :

	Colourless
	Pale/Light grey
	Light green
	Dark green
	Brown
	Black

d: Lake size :

Length	
Width	
Depth	
Area	
Volume	

2 Sources of water :

	Ground water sepage
	Ground water pumped surface
	Ground water pumped Aquafer
	Rain water
	Drain water
	Domestic waste
	Treated Sewage Effluent
	Untreated Sewage Effluent

3 Intented Usage :

	Ameinity
	Irrigation
	Domestic water supply
	Industrial water supply
	Cultivation ponds
	Rain/Fresh water storage
	Drainage lakes

4 Aquatic life :

	Live healthy fish
	Increased fish population
	Decreasing fish population
	Vareity of fish
	Dead fish
	No more fish

5 Water circulation :

Water inflow rate			
Evaporation rate			
Water circulation		Yes	No
No. of inlets			
Water consumed			
Water expelled			
Notes			

6 Pollutants :

	No pollutants
	Domestic waste
	Industrial waste
	Dead/Decay matter
	Drain water
	Polluted air

7 Aeration [No. of items in use] :

	Zero aeration devices
	Fountains
	Aerators-Sub surface Diffusers
	Circulatory pump-sub surface
	other devises
Details	

8 Chemicals in use [quantities pw] :

9 Algae Type [present management] :

10 Priorities :

11 Additional comments :

Recorded by:

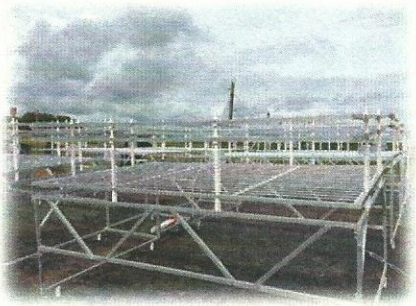
About the Company

Introducing the Scientists & Technology background:

Russian technology developed through 50 institutes with over 500 scientists during the 70's and 80's latterly under the leadership of Prof Yuri Tkatchenko. During the early 90's the Professor relocated a small science management R&D team to the UAE and created a long term partnership and the Magnetic Technologies Company with Sheikh Junaid Khoory. During the past 20 years further research and development continued along with expansion into the global market place, with over 50 different applications into various industries and sectors of the environment.

The technology spectrum not only addresses land based solutions but also weather modification and atmospheric influencing technologies, dissipating air pollution over cities, enhancing rainfall in to catchment zones, shielding critical communities from sand storms, protecting transport infrastructure from fog and reducing humidity within cities.

Magnetology is the earths' oldest technology, which it uses to protect itself from the extremes of the sun and for realignment of the waters molecular structure and much more; it is the life force of everything living. The scientists within Magnetic Technologies carry forward the understanding that magnetism is a natural resource, that upon being understood and applied correctly can create enormous benefits and contributions to many of the earths' environmental, water and food resource and health challenges.



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